What is claimed is:

Sub A7

1. A three-dimensional imaging system for acquiring a succession of two-dimensional images of a target volume represented by an array of pixels and transforming the succession of two-dimensional images directly into a three dimensional image, the system comprising:

scanning means to: (i) scan the target volume using an angular scanning technique, and (ii) generate a succession of digitized two-dimensional images thereof representing cross-sections of the target volume on a plurality of planes spaced around an axis of rotation of the scanning means;

memory means storing the succession of digitized two-dimensional images and a data set, the data set comprising: (i) calibration parameters defining the geometric relationship between successive digitized two-dimensional images; and (ii) acquisition parameters defining the geometric and orientational relationship between successive digitized two-dimensional images; and

transformation means for: (i) receiving the digitized two-dimensional images and the data set, and (ii) transforming the digitized two-dimensional images directly into a three-dimensional image of at least a portion of the target volume.

2. An imaging system as defined in claim 1, wherein the angular scanning technique is an axial scanning technique.

3. An imaging system as defined in claim 1, wherein the angular scanning technique is a fan scanning technique.

4. An imaging system as defined in claim 1, wherein the data set includes data defining:

(i) an address pointer defining the address of the location in the computer memory in which the acquired digitized two-dimensional image data starts

(ii) the horizontal and vertical voxel sizes of the acquired images;

(iii) the location of the axis of rotation of the transducer with respect to each of the succession of images;

(iv) the width and height (i.e. x and y) of each acquired image and the total number of acquired images;

(v) the relative orientation of each acquired image to the transducer actuating assembly;

(vi) the angular separation of each acquired image; and

(vii) the total angle of acquisition.

5. An imaging system as defined in claim 2, wherein the data set further includes data defining:

(viii) the degree of out-of-plane tilt of the transducer;

(ix) the degree of out-of-plane displacement; and

(x) the degree of in-plane tilt.

6. An imaging system as defined in claim 1, wherein the calibration parameters comprise (i) the horizontal and vertical voxel sizes of the acquired images; and (ii) the location of the axis of rotation of the transducer with respect to each of the succession of images.

7. An imaging system as defined in claim 6, wherein the calibration parameters further comprise (iii) the degree of out-of-plane tilt of the transducer; (iv) the degree of out-of-plane displacement; and (v) the degree of in-plane tilt.

8. An imaging system as defined in claim 1, wherein the acquisition parameters comprise (i) the width and height (i.e. x and y) of each acquired image and the total number of acquired images; (ii) the relative orientation of each acquired image to the transducer actuating assembly; (iii) the angular separation of each acquired image; and (iv) the total angle of acquisition.

9. An imaging system as defined in claim 4, wherein item (iv) comprises the number of pixels along the x and the y axis of each two-dimensional image and the total number of two-dimensional images taken.

10. An imaging system as defined in claim 4, wherein item (ii) comprises the physical distance between the centres of adjacent pixels in both the x and the y directions in each two-dimensional image.

11. An imaging system as defined in claim 1, wherein the transformation means includes a means to generate a reverse map.

Sub A9

12. An imaging system as defined in claim 11, wherein the reverse map encloses edges of each two-dimensional image and is oriented in a plane orthogonal to the planes of the two-dimensional iamges.

13. A method of transforming a succession of two-dimensional images of a target volume represented by an array of pixels directly into a three dimensional image, the method comprising the steps of:

scanning the target volume along an angular scanning path;

generating a succession of digitized two-dimensional images representing cross-sections of the target volume on a plurality of planes spaced around an axis of rotation of the scanning means;

storing the succession of digitized two-dimensional images in a memory;

storing a data set in the memory, the data set comprising (i) calibration parameters defining the geometric relationship between successive digitized two-dimensional images; and (ii) acquisition parameters defining the geometric and orientational relationship between successive digitized two-dimensional images;

accessing the digitized two-dimensional images and the calibration file; and

transforming the digitized two-dimensional images directly into a three-dimensional image of at least a portion of the target volume.